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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Date: March 18, 2005

STEPHEN F. GASS, ROBERT L. CHAMBERLAIN, BENJAMIN B. SCHRAMM, JOEL F. JENSEN and JONATHAN N. BETTS-LACROIX

Serial No.: 09/929,426

Examiner Jason D. Prone

Filed: August 13, 2001

Group Art Unit 3724

For: DETECTION SYSTEM FOR POWER EQUIPMENT

To: Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPEAL BRIEF

1. Real Party in Interest.

The real party in interest is SD3, LLC, the assignee of the above-identified application. SD3 is a privately owned Oregon limited liability company.

2. Related Appeals and Interferences.

There are no other appeals or interferences known to applicant which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

3. Status of Claims.

The application was filed with claims 1-25. Claims 1-8 were finally rejected in an office action mailed June 17, 2004. Claims 9-25 have been withdrawn from consideration due to a restriction requirement. The appealed claims are claims 1-7.

4. Status of Amendments.

Applicant filed an amendment after final, canceling claims 8-25 without prejudice. The examiner has not indicated whether that amendment has been entered.

5. Summary of Invention.

The claims involved in this appeal describe a woodworking machine with a new safety system designed to detect contact between a person and a cutter and to trigger some predetermined action if contact is detected. The contact detection system is adapted to distinguish contact with a person from contact with other items so that the predetermined action is not triggered unnecessarily. One embodiment of the woodworking machine is a table saw that detects when a person accidentally contacts the spinning blade and then stops and/or retracts the blade to minimize any injury. The table saw distinguishes contact with a person from contact with green or wet wood so that the reaction system does not trigger when cutting the wood. Table saws embodying this technology are currently being sold under the name SawStop.

The machine of claim 1 includes a conductive cutter adapted to cut a workpiece (such as cutter 40 in Figure 2), and a motor adapted to drive the cutter. A contact detection system (such as detection subsystem 22 in Fig. 1) imparts an electrical signal to the cutter and the electrical signal has at least one property that changes when a person contacts the cutter. If a person contacts the cutter, then a reaction system (such as reaction system 24 in Fig. 1) causes a predetermined action to take place. (Embodiments of various contact detection systems are shown in Figures 5-17 and discussed on pages 11-31 of the submitted specification and in paragraphs 40-84 of the published application. An exemplary change in signal property that occurred when an actual finger contacted the blade of a table saw is shown in Fig. 7.)

Claim 1 specifies that the contact detection system is adapted to distinguish contact between a person and the cutter from at least one other event generating a

comparable amount of change in the relevant property of the electrical signal based on the time during which the change in the property occurs. For example, green wood may cause the signal property to change because it is somewhat conductive, but the change occurs slower than if the blade contacts a person. Thus, in this example, the contact detection system would distinguish between cutting green wood and cutting a person by looking at the time during which the signal property changed. (This is discussed at various locations in the specification, including pages 23:15 to 26:15 and pages 29:10 to 30:19 of the submitted specification, and paragraphs 65-71 and 79-82 of the published application.)

Claims 2-7 all depend from claim 1, either directly or indirectly. Claim 2 further recites that the signal property is voltage amplitude. Claim 3 recites that the contact detection system is adapted to identify contact between a person and the cutter as a reduction in the voltage amplitude of at least 5% within 100 microseconds. Claim 4 recites that the time during which the change in the signal property occurs is less than one millisecond, and claim 5 recites that the change occurs in less than 100 microseconds. Claim 6 recites that the event which generates a comparable amount of change in the signal property is contact between the cutter and green wood. Claim 7 recites that the predetermined action includes stopping the movement of the cutter.

6. Issues.

The issues on appeal are as follows:

1. Are claims 1, 2, 4, 5 and 7 anticipated under 35 USC 102(b) by U.S. Patent No. 5,942,975 to Sorensen?
2. Is claim 3 obvious under 35 USC 103(a) in light of Sorensen?
3. Is claim 7 obvious under 35 USC 103(a) in light of Sorensen combined with U.S. Patent No. 6,366,099 to Reddi?

7. Grouping of Claims.

Claims 1, 2, 4, 5 and 7, which were rejected as a group under 35 USC 102(b), do not stand or fall together. Claims 4 and 5 are separately patentable.

8. Argument.

Anticipation Under 35 USC 102(b)

Claims 1, 2, 4, 5 and 7 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 5,942,975 to Sorensen. The Board should reverse that rejection because Sorensen fails to disclose all the limitations of those claims and "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); see also, 35 USC 102(b) and MPEP 2131.

Claim 1 describes a woodworking machine having a cutter, a motor to drive the cutter, and a contact detection system to detect when a person contacts the cutter. The contact detection system is electrically coupled to the cutter to impart an electrical signal to the cutter. The electrical signal has at least one property, and that property changes

when a person contacts the cutter because a human body is conductive and has capacitance (i.e., it can store electrical charge). The contact detection system detects contact between a person and the cutter by looking for a pertinent change in the signal property. If the contact detection system sees the change, then a reaction system causes a predetermined action to take place.

Claim 1 further specifies that "the contact detection system is adapted to distinguish contact between the cutter and the person from at least one other event generating a comparable amount of change in the at least one property based on the time during which the change in the at least one property occurs." This limitation addresses the fact that a woodworker may need to cut a workpiece that could cause the signal property to change in an amount comparable to when a person contacts the cutter. For example, some green or wet wood could affect the signal property because the moisture in the wood increases the dielectric constant and conductivity of the wood. If the moisture content is high enough, then the signal property could change in an amount comparable to when a person contacts the cutter. This change, however, occurs more slowly than when a person contacts the cutter because it depends on the amount of green or wet wood adjacent the cutter and it takes many milliseconds for the wood to go from not touching to surrounding the cutter. Claim 1 recites a system that makes use of this difference by specifying that the contact detection system is adapted to distinguish human contact from other events based on the time during which the change in the signal property occurs. Without this claimed feature, the contact detection system could interpret contact between green wood and the cutter as contact with a person, and the reaction system could then cause the predetermined action to take

place unnecessarily. If the reaction system triggers unnecessarily, then the usability of the saw would be diminished.

One embodiment of a contact detection system as described in claim 1 is shown in Figures 5-15 of applicant's specification. That embodiment makes use of a gain control system including an amplifier 101 that drives an electric signal (the drive signal) onto plate 44. The drive signal induces a corresponding signal (the sense signal) on plate 46 through blade 40. A micro-controller 171 is programmed to adjust the drive signal up or down to maintain the desired sense signal on plate 46. In this embodiment, the controller is capable of skewing the drive signal at a maximum rate of about 10% per millisecond. When cutting green wood, the sense signal may drop, but if it does, it drops at a rate which the controller can match and the controller would then ramp up the drive signal to keep the sense signal at the desired level. If a person contacts the blade, however, the sense signal will drop faster than the controller can match and the reaction system will trigger the predetermined action. In this manner, the contact detection system distinguishes contact between the cutter and the person from contact with green wood based on the time during which the change in the signal occurs (This system is discussed on pages 23-25 of the submitted specification and in paragraphs 65-68 of the published specification.)

Another embodiment of the claimed contact detection system is shown in Figures 14-18 of applicant's specification. In that embodiment, the sense signal on plate 46 is fed into a sense amplifier 190 and the output of the sense amplifier is fed into a level detector. The level detector generates a DC output proportional to the amplitude of the sense amplifier. The output of the level detector is then fed into a differentiator and

the differentiator generates an output proportional to the rate of change of the sense amplifier output amplitude. The sense amplifier output changes quickly when a person touches the blade, but changes relatively slowly when cutting green wood, and the differentiator is tuned to respond to the quicker change but not the slower. The output of the differentiator is then fed to a comparator that acts as a threshold detector. When the output of the differentiator has reached a predetermined level indicative of contact with a person, the threshold detector signals the controller and the reaction system triggers the predetermined action. In this embodiment, the contact detection system uses a differentiator to distinguish contact between the cutter and the person from contact with green wood based on the time during which the change in the signal occurs. (This system is discussed in the published specification at paragraphs 79-82.)

The limitation in claim 1 requiring a contact detection system adapted to differentiate contact based on the time during which a signal change occurs distinguishes the claim from the Sorenson reference. Sorenson discloses a device for sensing the distance between a first object and a second object. (Sorenson, column 1, lines 13-15.) The first object may be a person and the second object may be the blade of a chain saw. (Sorenson Fig. 3.) A function generator (shown in Sorenson Fig. 1) transmits a signal to the person, and the person then transmits the signal outwardly. A receiver (shown in Sorenson Fig. 2) then looks for the signal from the person. If the receiver detects the signal with amplitude above a predetermined threshold, then the receiver triggers some protective action. (Sorenson, column 9, lines 10-36.) Whether the receiver detects the signal with amplitude above the predetermined threshold depends on the distance between the person and the receiver; the closer the person is

to the receiver, the bigger the amplitude of the signal received. (Sorenson, column 9, lines 37-55 & Fig. 4.) In a chain saw, the receiver may be positioned near the blade so that it detects when a person approaches the blade.

Sorenson, however, fails to disclose any system capable of distinguishing a change in signal based on the time during which the change occurs, as required by the appealed claims. In particular, Sorenson discloses a system that only looks to see whether the voltage amplitude of a signal exceeds a predetermined threshold, regardless of when or how the amplitude may have changed. In fact, the receiver disclosed in Sorenson cannot detect the rate of change in amplitude of the signal because it fails to include a gain control system to skew the signal over time, a differentiator, or any other mechanism or system by which the rate of change of the voltage amplitude could be measured. The receiver shown in Fig. 2 of Sorenson includes a tone detector (identified in Fig. 2 as "XR2211") that outputs a high signal if the voltage amplitude of the received signal ever exceeds a predetermined threshold. In Sorenson, the tone detector is an analog device that outputs the high signal irrespective of whether or at what rate the amplitude may have changed. This is explained in Sorenson at column 9, lines 28-34, as follows:

> The signal is thereafter detected by a very selective tone detector XR2211 the threshold of the detected signal is adjusted by two variable resistances R10 and R11. When the tone detector detects a 100 khz signal with the desired amplitude the output (signal detect output) goes from low (logical "0") to high (logical "1"). This signal (signal detect output) may be used to activate protective measures such as a braking mechanism controlled by for instance a relay or by triac.

This is the point of disagreement between applicant and the examiner. Applicant believes Sorenson fails to disclose a contact detection system adapted to distinguish

different contacts based on the time during which the change in amplitude occurs, but the examiner says it does and he cites to column 5, lines 63-64 in the Sorenson patent to support his position. (Final Rejection, 3.) The cited portion of the Sorenson patent, however, only talks about the frequency of the signal; it makes no reference to the rate of change of amplitude. The cited portion is reproduced below:

> The predetermined frequency is preferably in the range 10 hz-200 khz, more preferably in the range 1-150 khz and most preferably in the range 10-100 khz.

The examiner explained his position as follows:

> The property that is changing [in Sorenson] is the alternating voltage, which has a frequency defined as the change in the value of the voltage amplitude per unit time. Therefore, Sorenson discloses a contact detection system that distinguishes between events generating a comparable amount of change in a property that is based on time during which a change in the property occurs. (Final Rejection, 7.)

Apparently the examiner believes that Sorenson can measure the rate of change of voltage amplitude simply because the signal carrying the amplitude is an alternating signal with a given frequency. But that is incorrect. Being responsive to amplitude within a certain frequency band is not the same as measuring the rate of change of that amplitude. In order to measure the rate of change, some system or mechanism such as a gain control or a differentiator would be required. Moreover, the Examiner is simply mistaken concerning his definition of frequency. Frequency is not "the change in the value of the voltage amplitude per unit time" – that is the differential of the voltage amplitude. Rather, frequency is "the number of cycles per second of an alternating electric current." (Webster's New Twentieth Century Dictionary of the English Language Unabridged, 732, Prentice Hall Press, 2 ed. (1983).

In summary, Sorenson simply detects whether the amplitude of an alternating signal exceeds a predetermined threshold. It does not disclose or suggest any system or mechanism to measure the rate of change of that amplitude and it does not identify a reason to do so. Therefore, Sorenson cannot anticipate the claims on appeal.

Claim 4 is separately patentable from claim 1 because claim 4 recites that the change in signal property occurs "in less than one millisecond." Similarly, claim 5 is separately patentable from claim 1 because it recites that the change in signal property occurs "in less than one hundred microseconds." These rates are separately patentable because they are useful for specific control systems, such as those that use gain control or a differentiator to distinguish contact with green wood, and nothing in Sorensen discloses or suggests any such systems or rates.

Obviousness Under 35 USC 103(a)

Claim 3 stands rejected under 35 U.S.C. §103(a) as obvious in light of Sorenson, and claim 6 stands rejected as obvious in light of Sorensen combined with U.S. Patent No. 6,366,099 to Reddi. The Board should reverse those rejections because the cited references fail to show or suggest all the limitations in those claims and obviousness cannot be established unless the cited references teach or suggest all the claim limitations. See MPEP 2143.03.

Claim 3 depends from claim 1 and distinguishes Sorensen for the same reasons as claim 1. Claim 3 further specifies "the contact detection system is adapted to identify contact between a person and the cutter as a reduction in the voltage amplitude of the signal on the cutter of at least 5% within 100 microseconds." Sorensen fails to disclose or suggest any rate of reduction in amplitude as representative of contact between a

person and a cutter, and certainly fails to suggest the specific rate of 5% within 100 microseconds. In fact, Sorensen does not even identify the problem of distinguishing contact with a person from contact with green wood.

Claim 6 also depends from claim 1 and distinguishes Sorensen for the same reasons as claim 1. Claim 6 further recites that contact between a person and the cutter is distinguished from "contact between the cutter and green wood." Neither Sorensen nor Reddi teaches or suggests distinguishing contact between a cutter and a person from contact between the cutter and green wood. Nevertheless, the Examiner says, "it would have been obvious to one skilled in the art to set the sensitivity of the device of Sorensen to be able to distinguish between an event when green wood contacts the cutter from an event where a human touches the cutter in order to prevent misfiring of the braking system." (Final Office Action, 5.) That statement, as far as it is understood, does not accurately describe Sorensen. There is no sensitivity setting in Sorensen that may be set to distinguish contact between a person and the blade from contact between green wood and the blade. Moreover, contact with green wood may create a comparable amount of change in the signal, so simply adjusting sensitivity, as the Examiner's use of that phrase is understood, would not work to distinguish the two contacts. Something more is needed, and that is why applicant's claims include a limitation concerning the time during which the change occurs. Sorensen and Reddi both fail to teach or suggest any system to distinguish green wood from human contact based on the time during which a signal changes, and therefore the combination of those references cannot render claim 6 obvious. See MPEP 2143.03.

Claim 8 was also rejected as obvious and applicant traverses that rejection. Nevertheless, applicant filed an amendment after final canceling that claim without prejudice in order to simplify the issues on appeal. Accordingly, the rejection is moot and not discussed further.

Double Patenting

The final rejection included a rejection of claim 1 based on double patenting. Applicant has overcome that rejection by canceling the relevant co-pending claim. The Examiner filed a Supplemental Advisory Action mailed December 23, 2004 in which he noted that the double patenting rejection had been overcome.

9. Appendix.

Claim 1:

A woodworking machine comprising:

a conductive cutter adapted to cut a workpiece;

a motor adapted to drive the cutter;

a contact detection system electrically coupled to the cutter to impart an electrical signal thereto, where the electrical signal has at least one property, and where the at least one property is changed when a person contacts the cutter, and where the contact detection system is adapted to distinguish contact between the cutter and the person from at least one other event generating a comparable amount of change in the at least one property based on the time during which the change in the at least one property occurs; and

a reaction system adapted to cause a predetermined action to take place upon detection of contact between the person and the cutter by the contact detection system.

Claim 2:

The machine of claim 1, where the at least one property is the voltage amplitude of the electrical signal.

Claim 3:

The machine of claim 2, where the contact detection system is adapted to identify contact between a person and the cutter as a reduction in the voltage amplitude of the signal on the cutter of at least 5% within 100 microseconds.

Claim 4:

The machine of claim 1, where the time during which the change in the at least one property occurs is less than one millisecond.

Claim 5:

The machine of claim 1, where the time during which the change in the at least one property occurs is less than one hundred microseconds.

Claim 6:

The machine of claim 1, where the at least one other event is contact between the cutter and green wood.

Claim 7:

The machine of claim 1, where the predetermined action includes stopping movement of the cutter.

Applicant requests the Board to reverse the final rejection of claims 1-7 and to allow those claims for the reasons stated herein.

Respectfully submitted,

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Date: March 18, 2005

David A. Fanning